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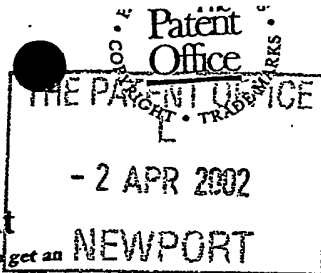
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- 2 APR 2002

Your reference

0207575.2

Patent application number
(The Patent Office will fill in this part)

Full name, address and postcode of the or of each applicant (underline all surnames)

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Patents ADP number (if you know it)

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Title of the invention

APPARATUS FOR COLLECTING PARTICULATE MATERIAL

Name of your agent (if you have one)

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Wildman, Harrold, Allen & Dixon
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Description 14

Claim(s)

Abstract

Drawing(s) 10 + 10

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Priority documents

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Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

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11.

I/We request the grant of a patent on the basis of this application.

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Date

28/03/02

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Apparatus For Collecting Particulate Material

This invention relates to an apparatus for collecting particulate material such as dust/debris.

5

For certain processes, such as the use of an escalator-type conveyor in a public arena, the collection and disposal of accumulated dust, oil, debris etc., is a mandatory safety requirement, to minimise potential fire

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hazards. Accumulated debris naturally falls off the underside of the conveyor and needs to be collected and contained. This objective is usually achieved by fitting static, open-topped, dust collection trays, to the underside of the conveyors. Such trays are well known

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and there are many types of trays for numerous types of applications. This type of arrangement satisfactorily achieves the aim of collecting the dust and debris.

20

However, in order to minimise fire hazards, and to ensure that fire safety regulations are not breached, it is required that, the trays receive regular, manual inspection and manual cleaning. This is expensive, in terms of time and labour, and sometimes the accepted fire risk levels are still exceeded. The cleaning operators are also exposed to regular contact with,

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potentially, harmful substances, from the accumulated dust oil debris etc.

The objectives of this invention are to:

30

1) Reduce the time and costs involved in inspecting and cleaning the collection tray.

2) Reduce the levels of fire risks, due to the accumulation of un-cleared dust/debris.

- 3) Reduce the exposure levels of the cleaning operators to potentially harmful substances.

According to a first aspect of this invention there
5 is provided an apparatus for collecting particulate material comprising a collection tray, a fire resistant collection reservoir associated with said collection tray, and means for moving particulate material from said collection tray into said fire resistant collection
10 reservoir.

Preferably, said reservoir is a container having a selectably operable lid.

15 Advantageously, said reservoir includes a removable collection unit.

Conveniently, said reservoir is located beneath one end of said tray.

20 Advantageously, said moving means comprise a motor driven scraper blade arranged to reciprocatingly move particulate material from an inside base portion of said tray and into said reservoir.

25 Preferably, when said scraper blade is positioned above said reservoir, means are provided for opening said reservoir lid so that particulate moved by said blade is deposited into said reservoir.

30 Advantageously, when said scraper blade is above said reservoir and said lid is open, means are provided for

cleaning the scraper blade, whereby particulate and dirt therefrom is deposited into said reservoir.

5 Preferably, when said scraper blade reciprocatingly re-traverses along said tray away from said reservoir, means are provided for closing said reservoir lid and for lifting said scraper blade away from said inside base portion of said tray so that particulate is not moved in a direction away from said reservoir.

10

Advantageously, when said scraper blade is arranged to reciprocatingly move particulate material toward and into said reservoir, means are provided for ensuring rigidity of said scraper blade and, preferably, said 15 means are provided for maintaining said scraper blade orthogonally to the inside base portion of said tray.

Preferably, means are provided for limiting the range of motion of said moving means.

20

Advantageously, said moving means is controllable by timer means to effect reciprocation of said moving means.

25 According to a second aspect of this invention there is provided a method of collecting particulate material including the steps of providing a collection tray into which particulate material is deposited, arranging a fire-resistant collection reservoir to be associated 30 with said collection tray, said fire-resistant collection reservoir having a lid, including the steps of providing means for moving particulate material toward said fire-resistant collection reservoir, opening

the lid of said reservoir and depositing said particulate into said reservoir.

Preferably, the method further includes the step of
5 lifting said moving means, moving said moving means away from said reservoir and closing said lid.

Thus, this invention provides a time-controlled, automatic, mechanised apparatus having a particulate
10 (dust/debris) collection tray with a combined fire resistant collection unit (reservoir). The accumulated dust/debris within the collection tray is automatically moved into a fire- proof collection unit.. This is achieved by utilising an automatic, timed, mechanically
15 driven, scraper device, which is located within the dust tray.. The scraping process, along the tray, automatically engages, and leaves secure, the fire resistant collection unit, into which the scraped dust, debris, oil, grease etc. is deposited. The fact that the
20 collection unit is fire resistant means that the accumulated dust/debris etc. can be kept safely within it, which means it need only to be emptied at much longer intervals. Thus the tray is regularly cleaned via an automatic timed mechanical device, and the
25 accumulated dust/debris, needs clearing from site less frequently; thereby achieving the objectives of points 1, 2 and 3 as identified above.

Preferably the tray and components will be made of fire
30 resistant and/or fireproof materials. The size and dimensions of the tray determined to suit the size, and appropriate-collection area, of the conveyor it is to be fitted to.

The invention will now be described, by way of example, with reference to the accompanying drawings in which:

5 FIGURE 1 shows a perspective view of an apparatus in accordance with this invention when viewed from above, with the dust tray lid 32 in position,

10 FIGURE 2 shows a perspective view of an apparatus in accordance with this invention when viewed from above, with the dust tray lid removed for clarity,

15 FIGURE 3 shows a side view of the apparatus with the scraper blade 24 travelling along the tray from left to right in the direction of arrow-headed line A.

20 FIGURE 4 shows a side view of the apparatus with the debris collecting hopper lid 18 open and the scraper blade 24 approaching the debris deposit zone into the removable collection tray 23 below.

25 FIGURE 5 shows a side view of the scraper 24 moving back along the dust tray 1 from right to left in the direction of arrow-headed line B away from the hopper debris collection unit 21 and engaging the scraper lift guide 10,

30 FIGURE 6 shows the scraper 24 having dropped off the end of the scraper lift guide 10 into a vertical position as it returns to its starting and finishing position for each complete cycle of clean,

FIGURE 7 shows an end view of the apparatus in the

direction of arrow-headed line C shown in Figure 1,

FIGURE 8 shows an enlarged, detailed view of the left hand side of Figure 7,

5

FIGURE 9 shows an enlarged, detailed view of the apparatus, demonstrating the position and fixing arrangements for the debris-collecting hopper 21,

10 FIGURE 10 shows an enlarged detailed front view of the scraper blade 24 with the fixing arrangement for the scraper blade hinge 28 and cleaning blade 25 on slotted holes on bolt fixing points 42.

15 In the Figures like reference numerals denote like parts.

It is to be understood that in the drawings, dust tray side panels where required or desired have been removed
20 for clarity.

Figure 1 shows the device viewed from above and shows the device fitted with a dust tray lid 32.

25 The tray lid 32 has angled flanges sloping in towards the base of the dust tray 1. The flanges of the tray lid 32 are angled to achieve three objectives: -

To protect and prevent debris/dirt build up over the
30 areas which cannot be cleaned by the movement of the scraper blade 24 i.e. those areas at the ends and immediate sides of the tray 1.

To direct dust/debris into the base of the tray 1

To minimise any dust/debris build up on the tray lid 32.

5 Figure 2 shows the device with the tray lid 32 removed.

The main body of the device is made up of a steel tray 1. The tray 1 can be free standing on a proprietary support, below a selected debris deposit/catchment area of the conveyor or mechanical item which, requires the need to have a dust/debris collection unit. Alternatively it can be attached to the underside of the conveyor or mechanical item by utilising the brackets 35 and proprietary fixings to suit.

15

Attached externally to the tray 1 are three items:

The first external item is the dust tray lid 32 (shown in Figure 1) which is secured in place with the dust tray lid fixing brackets 34.

20

The second external item is a dust/debris hopper collection unit 21, which has an inner removable tray 23 and a hinged outer door 22. The hopper debris collection unit 21 is attached to the underside of the dust tray 1 and extends across an opening in the base of the tray 1. This opening in the tray base is covered with a pivotal hopper lid 18.

25

30 The third external item is a control unit 3 attached to the front end of the tray 1 (The control unit 3 can be positioned to the side or separately to the tray 1 if necessary.) The function of the control unit 3 is to

control the timing and the stopping and starting of the electric motor 2, to which it is connected by a control cable 36.

- 5 The electric motor 2 operates the motor drive sprocket 5 which in turn operates the drive chain 44 which then operates the front axle drive sprocket 45 causing the front axle 4 to rotate in its bearing housing 6. The turning movement of the front drive axle 4 also turns
- 10 the scraper carriage chain sprocket 8 which in turn operates the scraper carriage chain 37 which rotates between the scraper carriage chain sprocket 8 and the scraper carriage tension axle sprocket 17.
- 15 The scraper carriage chain 37 is attached to the scraper carriage 7 with chain fixing pins 12. The scraper carriage 7 is then propelled forwards and backwards along the scraper carriage guide rail 9 on two scraper carriage guide wheels which, are fixed to the scraper
- 20 guide 7 with two scraper guide wheel fixing bolts 47.

Figure 3. shows a side view of the device with the scraper blade 24 travelling from left to right as shown by arrow-headed line A. The scraper blade 24 is

25 preferably made of steel and travels sufficiently closely (a few microns) to the bottom of the tray to sweep small particles therefrom.

This Figure shows the scraper carriage 7, moving on its carriage guide wheels 46, as it travels along the carriage guide rail 9. Also shown are the front and back limit switches 13F and 13B respectively. These limit switches are connected to the control unit 3 by

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electrical cabling (not shown for clarity) and are activated by the limit switch actuator 33. The activation of the limit switches 13F and 13B notifies the control panel of the position of the scraper carriage 7. The control panel is pre-programmed to stop and start the motor drive unit 2 in a forward or reverse mode dependant on which limit switch is activated. This process in conjunction with any pre-set timings controls the start, finish and number of cleaning cycles for the scraper cleaning mechanism.

The scraper blade 24 is maintained in a vertical position as it travels along the scraper guide rail 10 thereby allowing it to scrape any debris along in front of it.

FIGURE 4 shows the process of activation of the hopper lid 18, the cleaning blade 25 and the limit switch 13B.

As the scraper carriage unit moves from left to right the hopper lid operating roller 30 engages the hopper lid cam 19 which causes the hopper lid 18 to pivot upwards on a pivot pin 20. The movement of the scraper mechanism from left to right also moves the scraper blade 24 over the opening in the base of the tray 1. This allows any built up debris in front of the scraper blade 24 to fall into the removable inner tray 23 of the hopper unit 21. Attached to the front of the scraper blade is a sprung moveable cleaning blade 25. As the scraper mechanism moves forward the top of the cleaning blade 25 engages a tapered cleaner blade wedge 29 which forces the cleaning blade down on its spring 27. The downward movement of the cleaning blade 25 scrapes any

stubborn residue off the scraper blade 24 into the removable collection unit 23 below. As the scraper mechanism reaches the end of its forward cleaning cycle the limit switch 13B is activated by the limit switch actuator 33 which causes the control panel to stop the electric motor and to put it into reverse mode ready for the return leg of the cleaning cycle. In the event that the limit switch 13B fails to activate, the leading carriage guide wheel 46 is prevented from over-running the guide rail by coming into contact with the carriage guide end stop 38. This action would cause an overload in the motor unit 2 which would be sensed by the control panel 3 which would then turn off the motor.

FIGURE 5 shows a side view of the scraper 24 moving back along the dust tray 1 from right to left in the direction of arrow-headed line B away from the hopper debris collection unit 21 and engaging the scraper lift pivot 11.

This Figure 5 shows the hopper lid operating wheel 30 having disengaged from the hopper lid cam 19 as it moves along with the scraper carriage 7 away from the hopper collection unit 21 in the direction of arrow B. This movement in the opposite direction allows the hopper lid 18 to pivot back down into its closed position and the cleaning blade 25 to disengage from the taper wedge 29 and, by utilising the spring action of the cleaner blade spring 27, return upwards to its holding position on the scraper blade 24, and clear of the bottom edge of the scraper blade 24.

As the scraper blade 24 moves along from right to left it engages the front leading edge of the scraper lift

pivot 11 (which naturally tilts on its pivot pin in an inclined downwards position). The scraper blade 24 is designed with a notch 48 in each end (as shown in Figures 7 and 8) which allows it to travel along the scraper lift guide rail 10 in a vertical position when travelling in the cleaning direction from left to right, as shown by arrow-headed line A. When travelling in the cleaning direction from left to right, as shown by arrow-headed line A, the scraper blade notch 48 can engage the scraper lift pivot 11 at its back edge which causes the lift pivot to pivot up into a horizontal position in line with the scraper lift guide rail 10, thereby allowing the scraper blade notch 48 to pass along the scraper lift pivot 11.

Once the scraper blade notch 48 has passed the end of the scraper lift pivot 11 the scraper lift pivot 11 will then drop down on its pivot point into a downward inclined position. However, on the return leg of the cleaning cycle it is not considered preferable to be able to scrape/drag any residue debris away from the hopper unit 21 as this could cause an unacceptable build up of dirt/debris on the reverse side (downstream of the cleaning side) of the scraper blade 24. To avoid this event the scraper blade is designed to hinge in one direction (counter clockwise in Figure 5) utilising a scraper hinge 28. On the return leg of the cleaning cycle from right to left (in the direction of arrow-headed line B), when the scraper blade 24 engages the leading front edge of the downward tilting scraper lift pivot 11, the scraper blade 24 is forced to hinge counter clockwise upwards, and the scraper blade side notches 48 (shown in Figures 7 and 8) do not engage the

scraper lift guide rail 10. This action then forces the scraper blade to travel along in a raised hinged position on top of the scraper guide rail 10 and thus it cannot scrape or cause build up of debris on the reverse side of the scraper blade 24.

FIGURE 6 shows the scraper blade 24 having dropped off the end of the scraper guide lift 10 into a vertical position as it returns to its starting and finishing position for each complete cycle of clean.

The scraper blade 24 is assisted back into the vertical position by the contracting action of the scraper blade spring 26. As the scraper carriage 7 reaches the start finish point of its cleaning cycle the limit switch actuator 33 will engage the limit switch 13F which will initiate another pre-programmed set of instructions from the control panel 3. These instructions will either continue or end the cleaning cycle until the programme timer tells the control panel to restart the cleaning cycle. Once again the scraper carriage guide 7 is prevented from excess travel by a carriage guide end stop 38a.

FIGURE 7 shows a cross section of the device viewed from the end of the control panel 3

This view shows how both sides of the device are arranged with an inter-connecting rod 31 between the two scraper carriages 7. Also viewable from this angle is the scraper blade notch 48 notch at both ends of the scraper blade 24. It can be seen that the scraper notch 48 is in line with the scraper guide rail 10 and it is

this notch which allows the scraper blade 24 to travel in a vertical position along the scraper guide rail 10 and holds the blade in a vertical direction when moving in the direction of arrow-headed line A.

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FIGURE 8 shows a detailed left hand cross section of Figure 7 (scraper carriage chain 37 on scraper carriage sprocket 8 omitted for clarity).

10 This Figure 8 shows how the scraper blade hinge 28 is attached to the scraper carriage 7 and scraper blade 24 via bolt fixings 40. Within the end area of the scraper carriage 7 can be seen large holes 41, which allow clearance for bolt fixings which attach the scraper
15 hinge 28 to the scraper blade 24 through the lower bolt holes 40. This clearance permits the scraper hinge 28 to sit flush against but not past the vertical of the back plate of the scraper mechanism 7. This therefore allows the scraper blade 24 to maintain a vertical position
20 during the forward cleaning cycle.

Also seen in Figure 8 are the cleaning blade fixing bolts 42, which are used to locate the cleaning blade 25 in slotted holes. The slotted holes within the cleaning
25 blade 25 allow it to move up and down as it is pushed down by the tapered cleaning wedge 29 and pulled back up by the action of the cleaning blade spring 27.

At the bottom of the Figure 8 can be seen the hopper
30 fixing plate 39 to which the hopper 21 attaches.

FIGURE 9 shows a cross section view of the device, which demonstrates the position and fixing arrangements

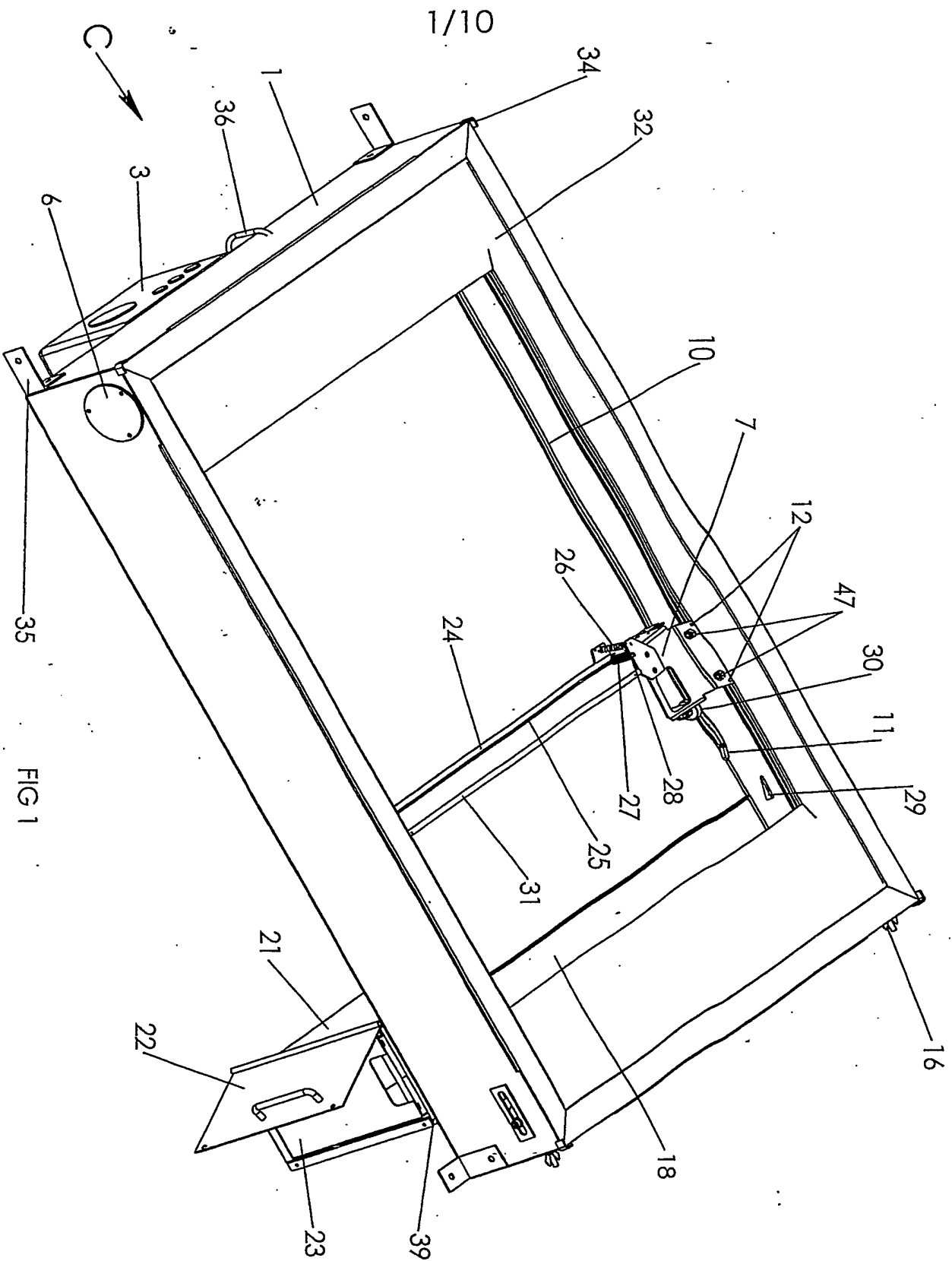
for the debris-collecting hopper 21.

This Figure shows how the hopper unit fixes onto the bottom of the tray 1 via fixing bolts through fixing plate screw holes 43 in the hopper fixing plate 39.

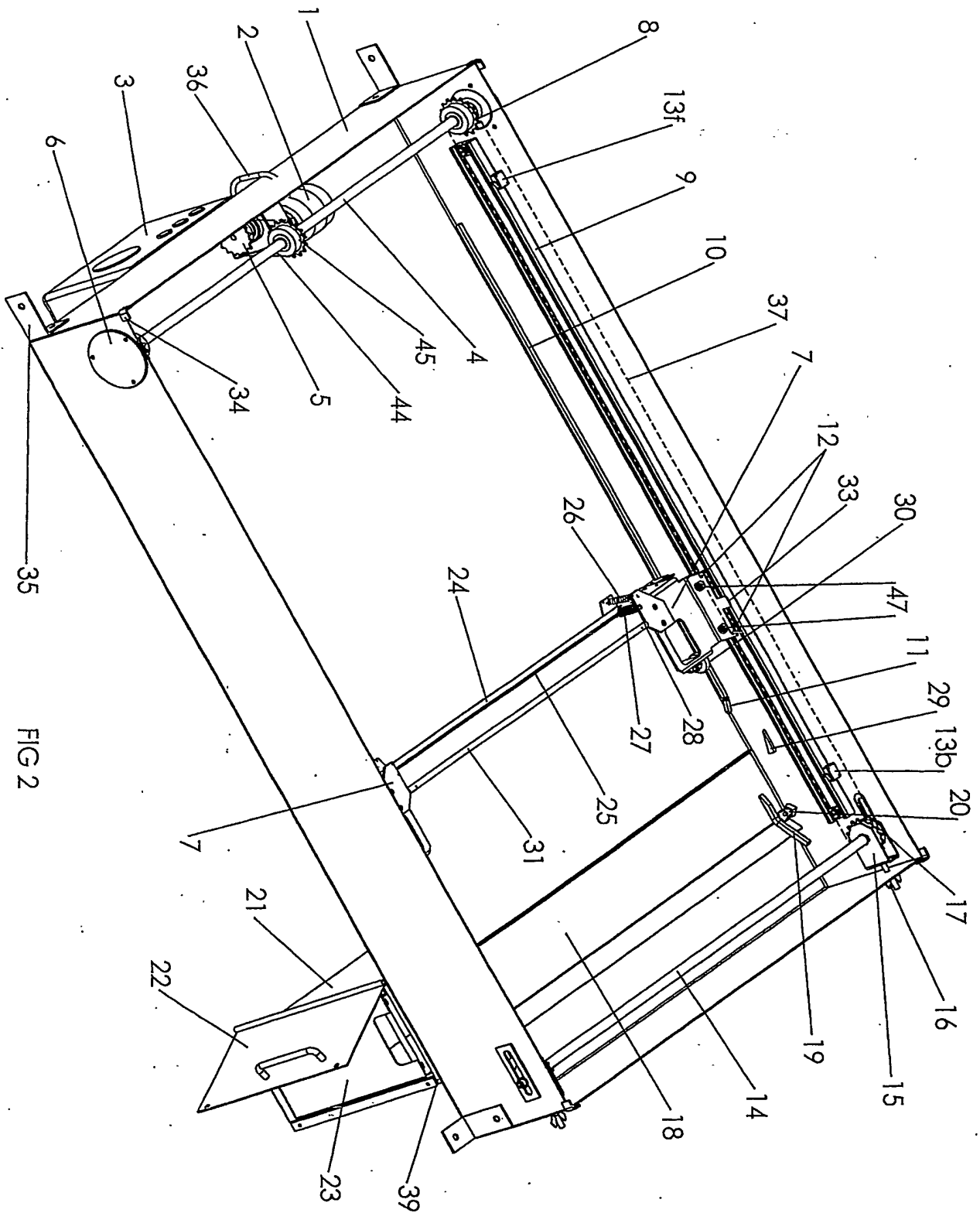
Also shown is the detail of the tension axle bracket 15, which holds the tension axle 14 and is adjusted via a tension axle adjuster 16.

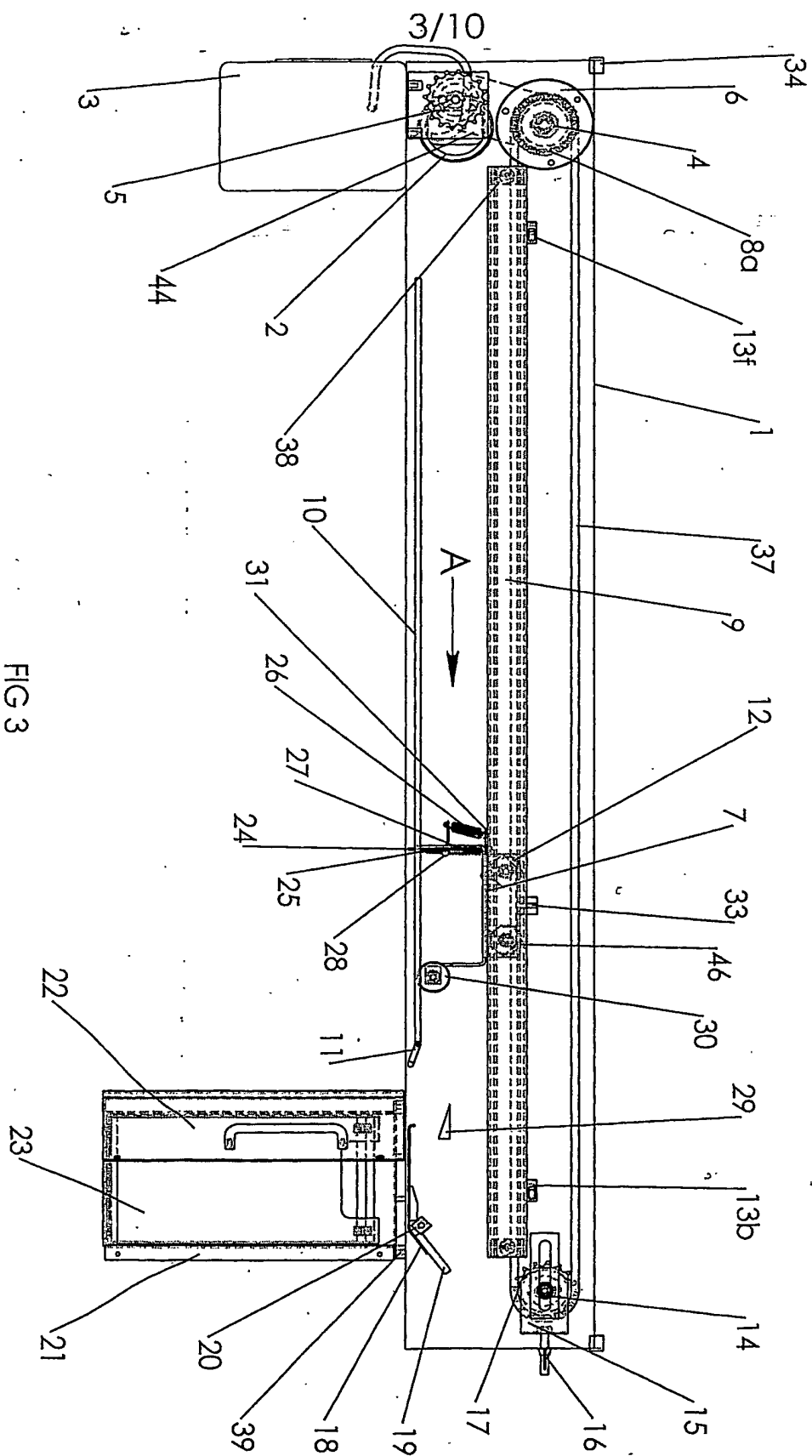
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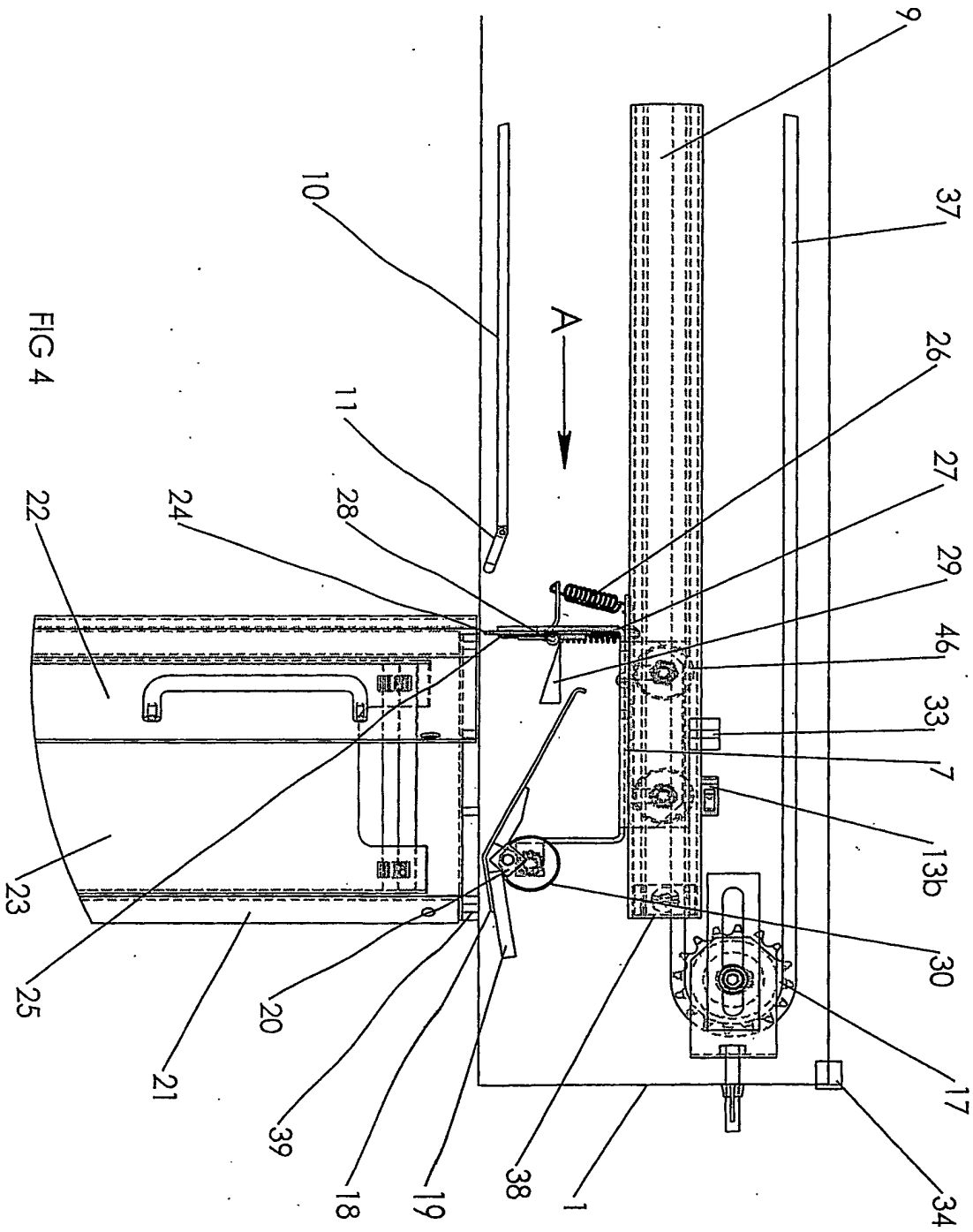
FIGURE 10 shows a front view of the scraper blade 24 with the fixing arrangement for the scraper blade hinge 28 and cleaning blade 25 in slotted holes on bolt fixing points 42.

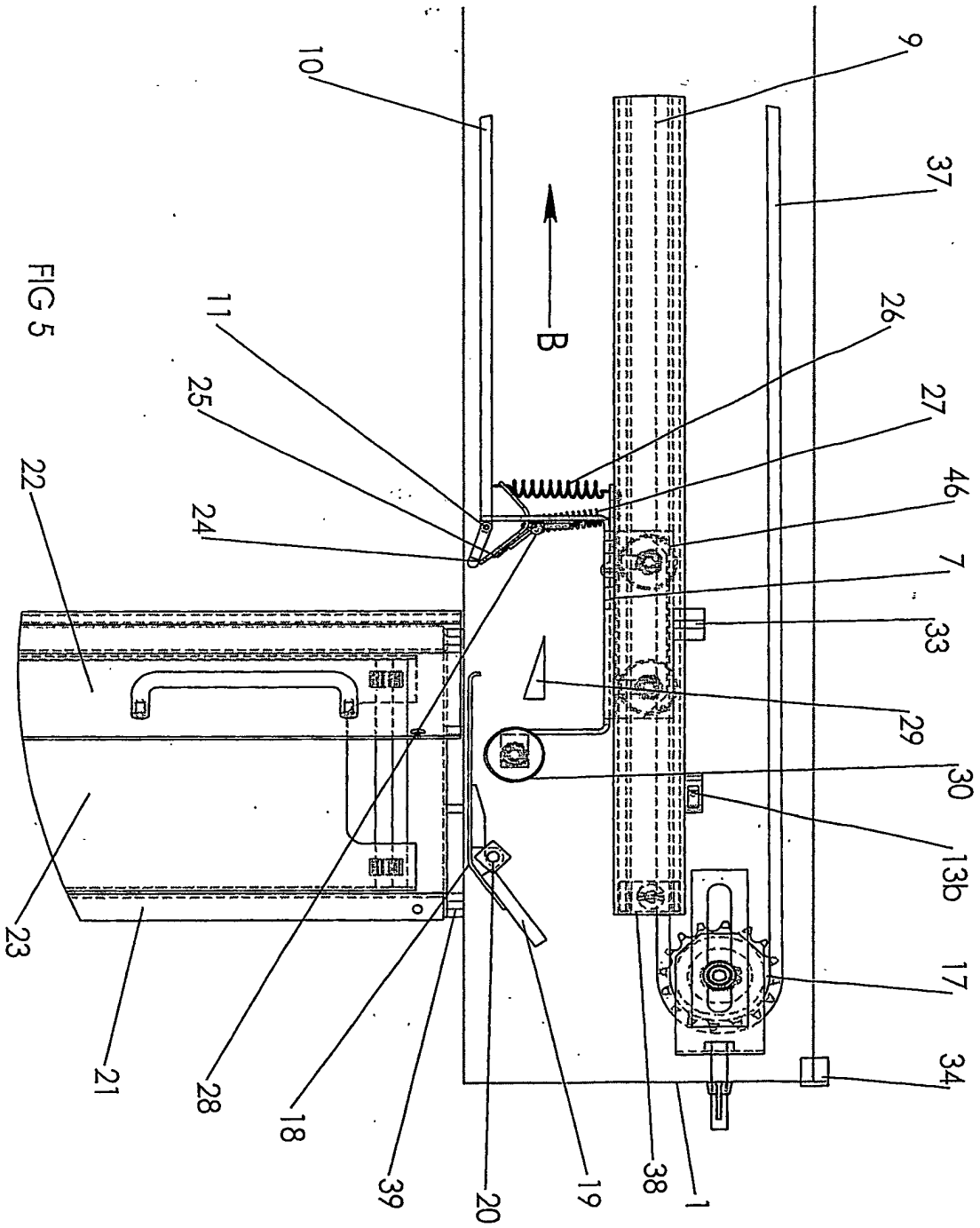


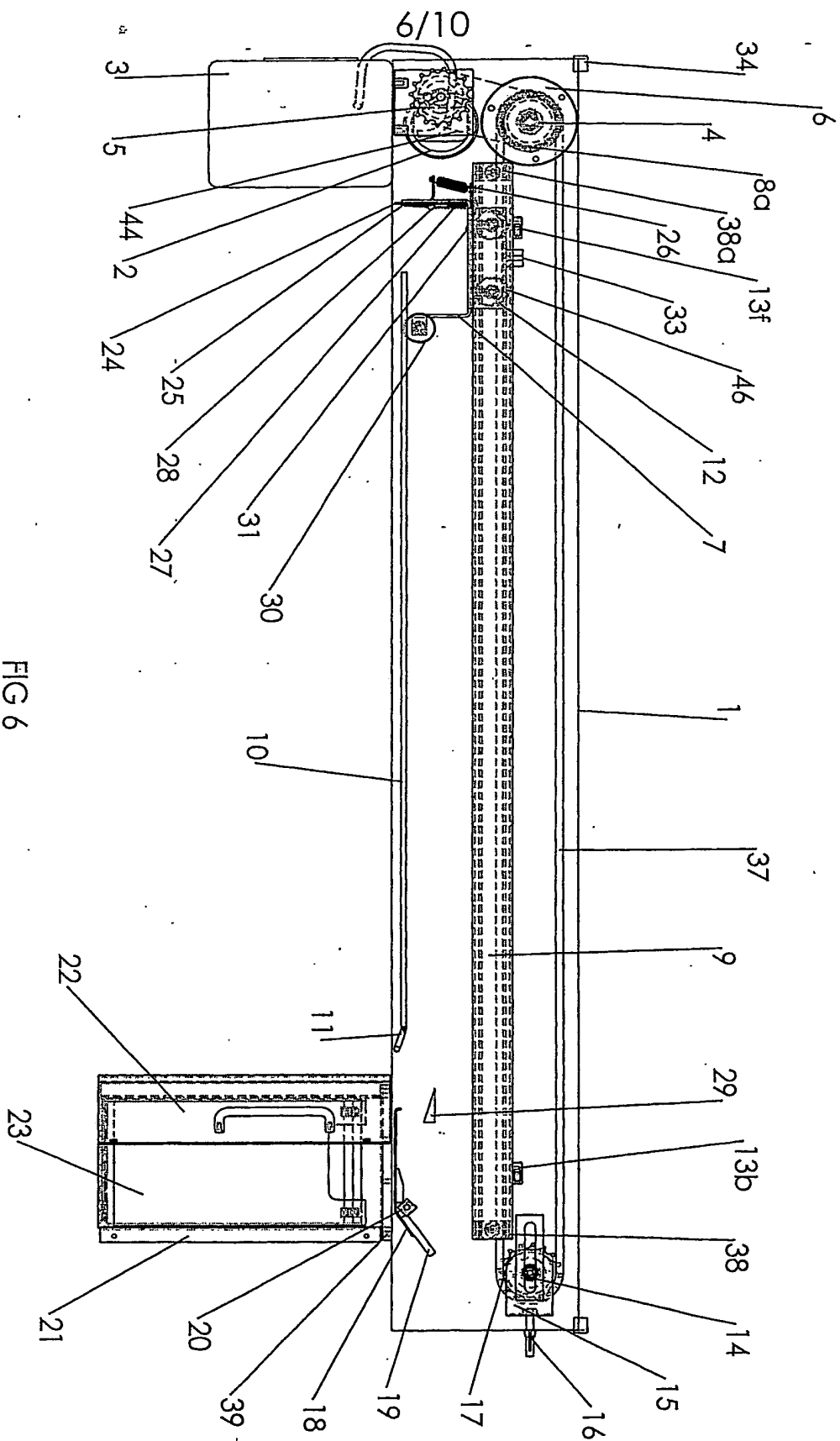
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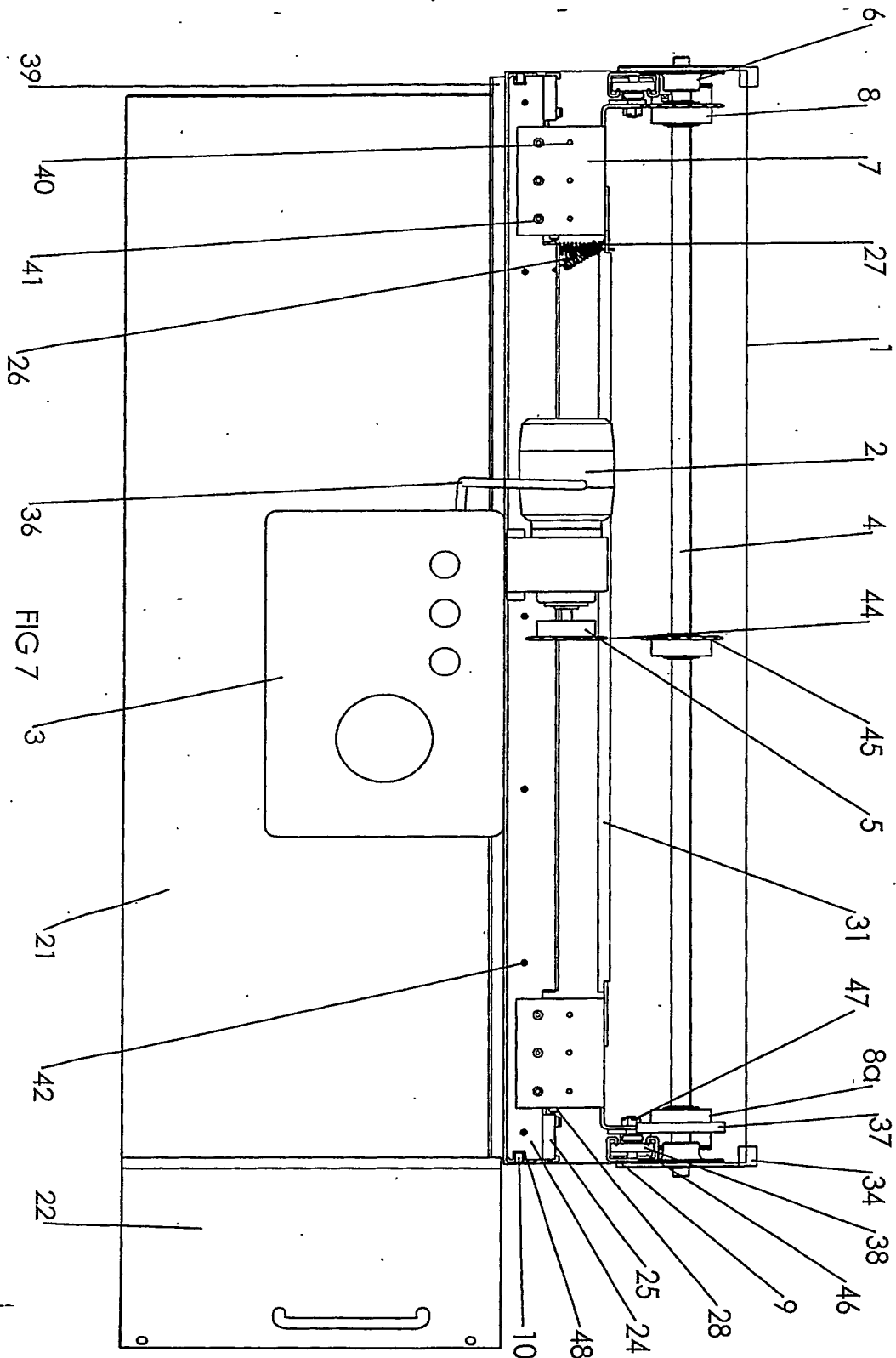


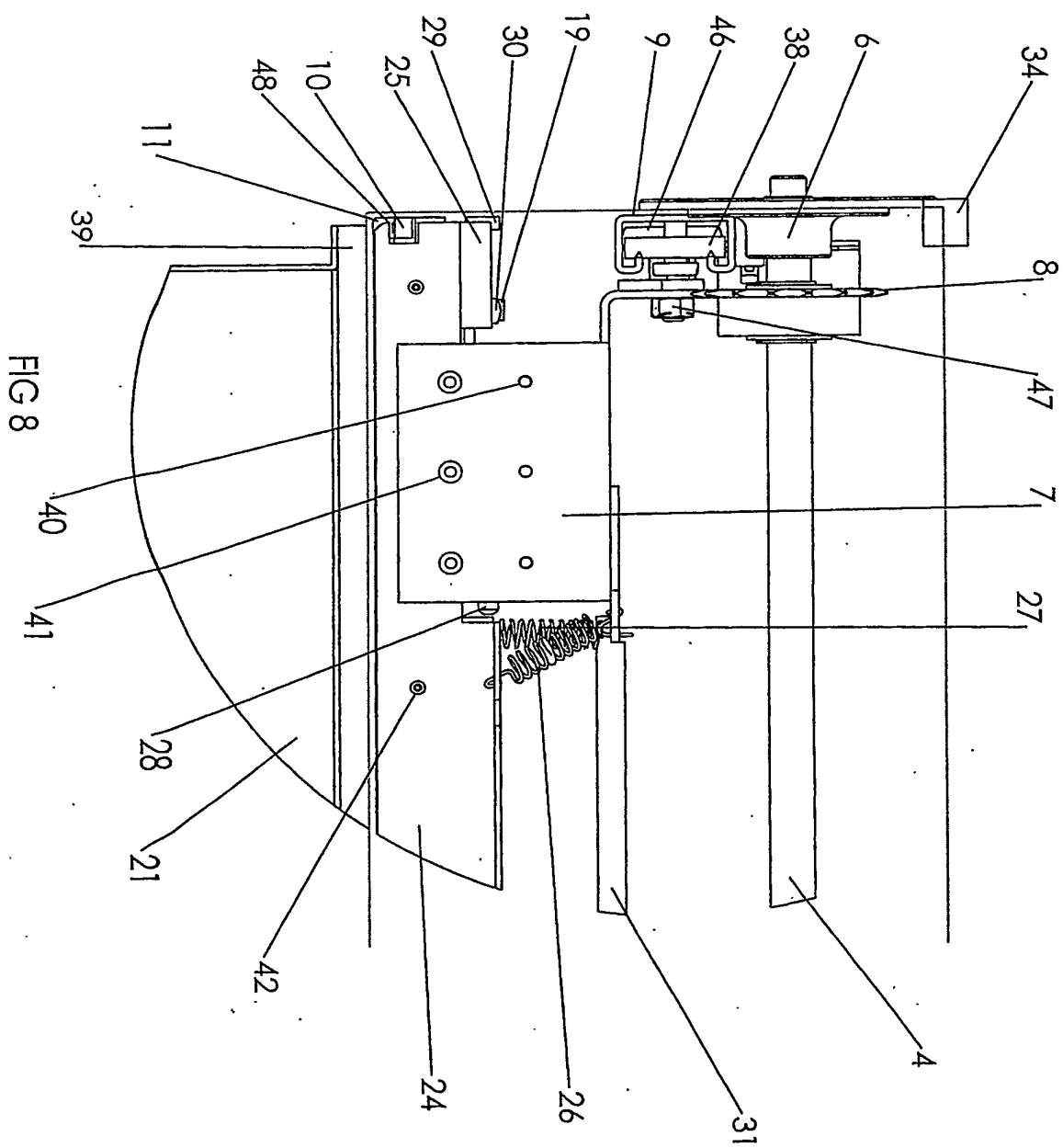


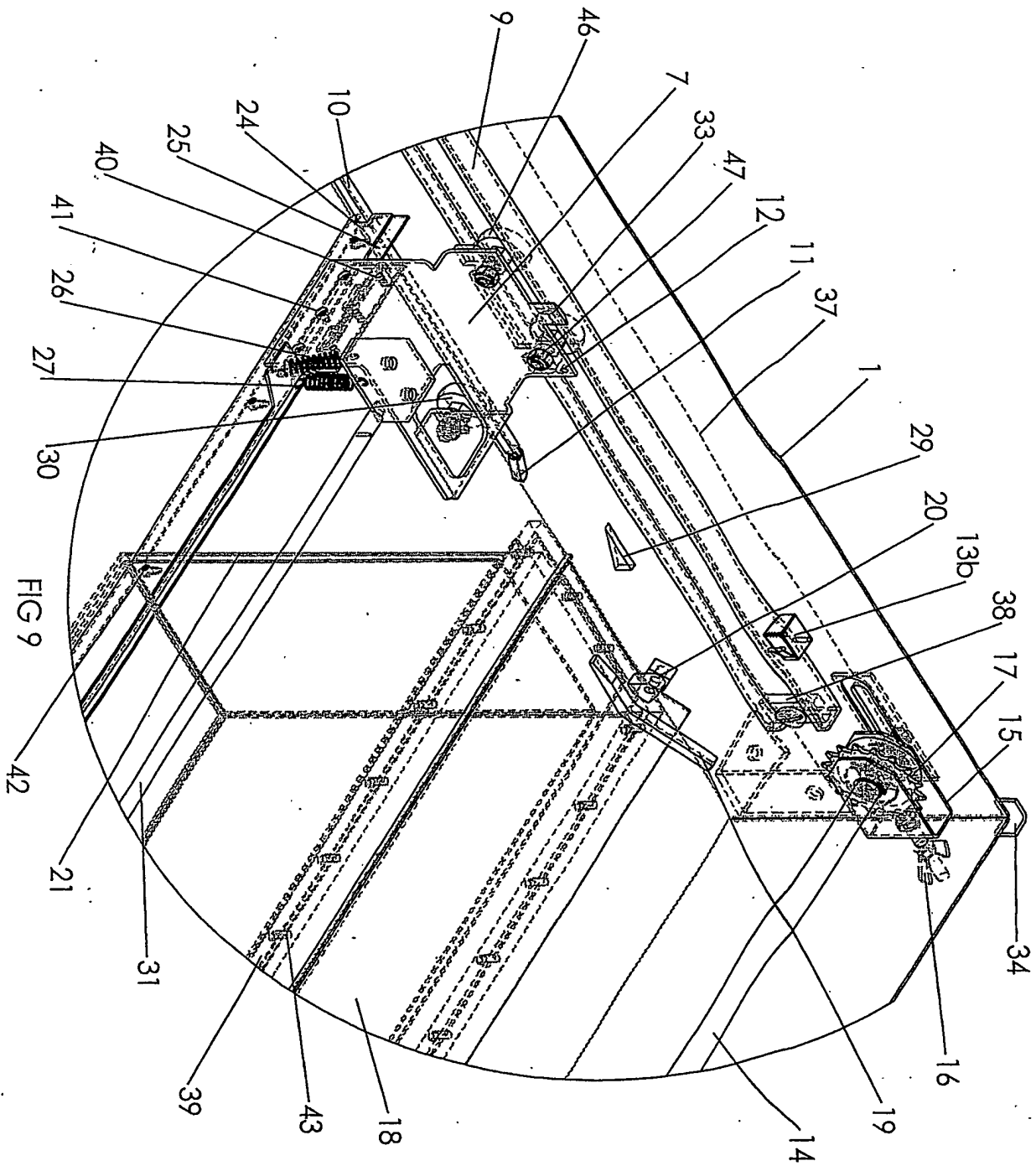


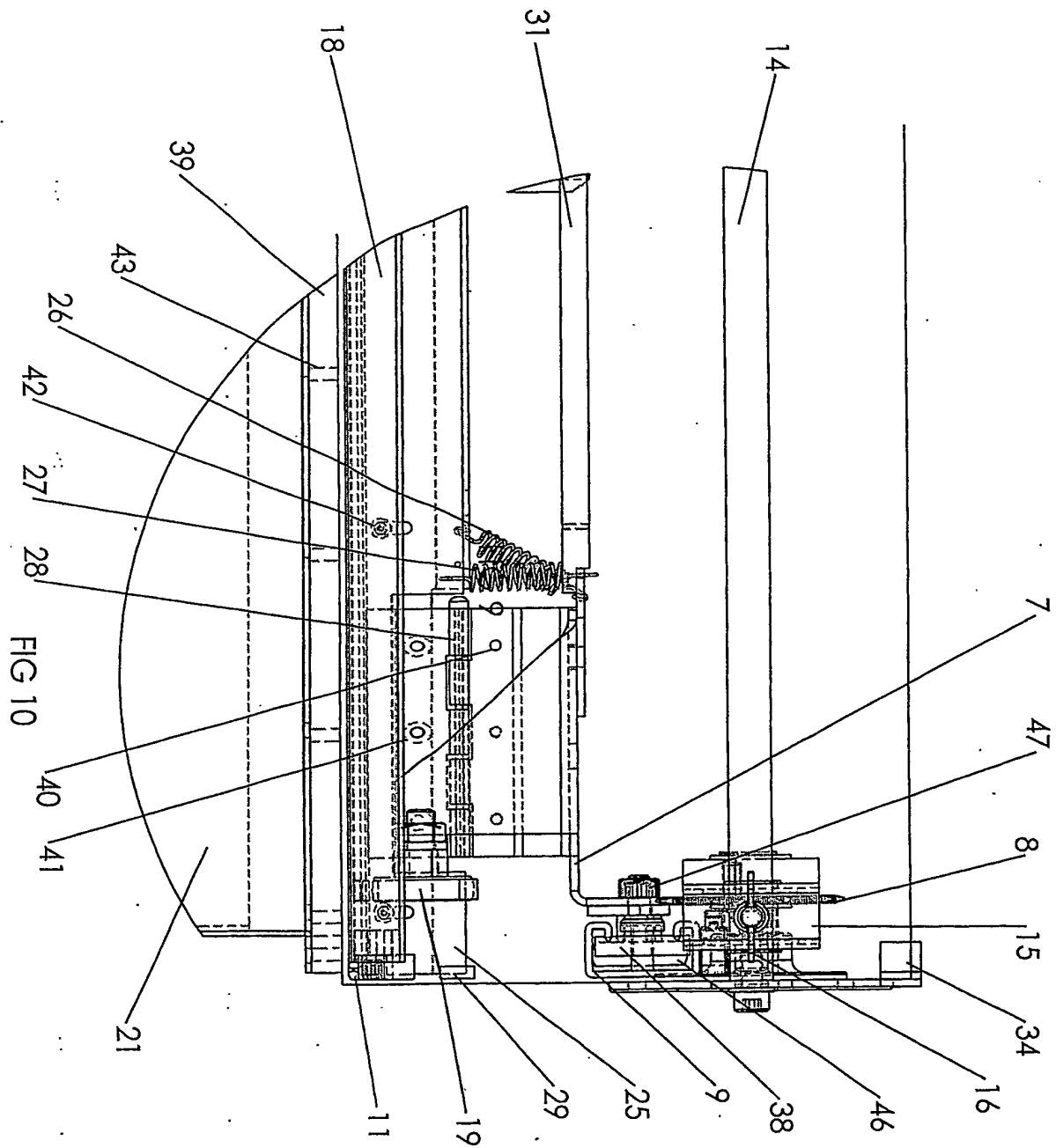


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